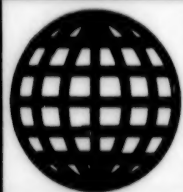


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Science & Technology

CHINA: Energy

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China: Energy

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Electric Power: Another Bottleneck in China's Economy

Energy Bottleneck in Economy

946B0022A Beijing RENMIN RIBAO in Chinese
11 Oct 93 pp 1, 2

[Article by Jiang Shijie [3068 0013 2638], RENMIN RIBAO reporter:]

[Text] [Editorial Note] Today, we begin a series dealing with electric power issues with this article, "Electric Power: Another Bottleneck in China's Economy." The subject matter of the series will be of two types: reportage uncovering contradictions and pointing out means of resolving them; descriptions of typical cases in power construction about which people have strong feelings.

For the people's economy to achieve sustained, rapid, and effective development, we must readjust industry's structure and conscientiously eliminate the bottlenecks that constrain it. This is a major, real issue of broad significance which should attract attention at all levels and from all quarters. Points of view, statements of concern, and advocacy from all parties will help to further clarify the situation, to achieve unity of understanding, to draw on collective wisdom, and to find better, more numerous and more effective methods and approaches to resolve the contradictions. In the future this paper will tackle major, multilevel problems of economic activity and economic life and will use serialized reports and continuing coverage to investigate and analyze them, so as to promote the appropriate solution of real problems. We hope those working in the economy will highlight themes for us.

It should be made clear that, for a variety of reasons, our reportage is not necessarily comprehensive; its objective is to prompt serious consideration by all quarters, to launch a discussion and to seek a consensus.

Everyone would agree that railroads are currently a bottleneck in the economy.

But if we were to state that electric power is another such bottleneck that is constraining China's economic development, not everyone would agree: many comrades would stare in blank surprise, wondering if this was indeed the case.

For did not China's national power output and installed capacity vault into fourth place in the world in 1987, and have they not retained this position since then? And in the five years since 1988, has not 60 million kW of new capacity been installed, equivalent to the total amount installed in the 30 years before the reform and opening to the outside?

And is it not true that, on average, China's electric power output in two days is now equivalent to its power output for the entire year of 1949?

It is true that these objections are all based on fact; but they do not give the whole story regarding China's electric power situation. There is another group of equally important facts.

Like a specter, power shortages have haunted China for more than 20 years. Numerous power outages or cutbacks indicate that even though electric power is supposed to be a vanguard, it is falling increasingly in arrears, and its rate of advance is being hobbled.

China's supply of electric power began to be tight in 1970, when there was occasionally not enough to go around. Because power generating equipment must be operated so as to maintain a constant balance between production, supply, and sales, the principal emergency measure used to "compensate" power shortages was to cut off or cut back on the supply of power. As a result, power supply planning offices (which later were also given the functions of power conservation and power safety, hence gaining the name of "three-power" offices) sprang up all over the country. Owing to their painstaking management, factories and mines, offices and units, and the urban and rural populace began to take turns in experiencing load cutbacks or power shutoffs one or more times a week.

In order to alleviate this intolerable situation, the party and government have taken a series of measures during the past 20 years, and the power industry has in fact made rapid strides. But the annual pace of the economy's development has also been fairly rapid, and as a result, a debate over whether the power industry is lagging behind has intermittently broken out.

At the end of the Seventh 5-Year Plan and the beginning of the Eighth 5-Year Plan, the dispute as to whether or not there was an electric power shortage re-emerged. One view was that from 1988 to 1991, the average amount of newly installed generating capacity exceeded 10 million kW, and that the country's power supply shortage had been alleviated. Proponents of this view pointed to the fact that in 1990, the number of power cutoffs or cutbacks in Beijing and the amount of power involved decreased by 79.1 and 76.77 percent respectively, compared with 1989, and in northeast China, power cutbacks and outages were essentially eliminated. Another view is that this alleviation was only temporary and resulted from a slump in production capacity during the period of administrative rectification. Neither viewpoint conceded to the other. But numerous events since 1992 have put an end to the debate: not only has China's electric power shortage not been fundamentally alleviated, but adversity has been piled on adversity as local power shortages have expanded into a national power shortage and intermittent outages have become continuous shortages.

Comrades of the National Electric Power Dispatching Communications Center gave a reporter the following information:

—China's per capita electric power output is now only 644 kWh, or 40 percent of the world average, leaving China in the 80th place in the world.

—Of the 30 province-level administrative units on the mainland, only the Ningxia Muslim Autonomous Region has a slight excess of supply over demand; all other provinces, autonomous regions, and directly subordinate municipalities are experiencing various degrees of difficulty in making ends meet.

—Beijing began to experience power shortages in the 1970s, and they are now increasing in severity. In 1991, the actual supply of electric power fell short of the planned figure by 400,000 kW; in 1992 the shortfall reached 493,000 kW; and in 1993 it will increase further, to 683,000 kW. In the first half of this year [1993], cutbacks in electric power reached 671,000 kW, an increase of 30.8 percent over the figure of 513,000 kW in the previous

year. The shortages were most severe in May, when the average daily power cutback rose rapidly to 1.395 million kW, an increase of 134 percent from the previous year.

- In the East China Grid, which has the greatest installed capacity of the country's five major power grids, during the first half of this year electric power output was up 9.87 percent from last year, but supply and demand conflicts were extremely acute: from January to May, in Jiangsu and Zhejiang provinces alone, there were 12,480 instances of power cutoffs or cutbacks mandated by the East China Grid General Scheduling Office or the Central Scheduling Offices of the two provinces' grid centers; this figure is 4.9 times the figure for the preceding year. The cumulative reduction in load was 79.24 million kW, 2.8 times the figure in the equivalent period of last year.
- In Guangdong Province, which is on the leading edge of China's reform and opening to the outside, the start of electric power shortages coincided with the beginning of economic growth. For more than a decade, the shortfall of electric power has been about 30 percent, and the purchasing of electric power from Hong Kong that began in 1979 will continue this year; the amount purchased has already increased by a factor of more than 10.
- The Northeast China Grid had no power shortages two years ago, but this year it will experience a shortfall of 900 million kWh, so that users who earlier suffered shutoffs and cutbacks will be subjected to the same unpleasantness again.
- Numerous incidents, both past and present, make it clear that China's electric power industry is falling far too short of society's continually expanding need for electricity for production and for household use.

The electric power shortage is not only holding back the continuous, steady, effective growth of the national economy, but is also adding to the electric power worries of the masses everywhere and infecting the power industry with persistent maladies.

Some liken electric power to the "life blood" of the national economy and electric power shortages to anemia: it is clear that an anemic patient will have no way of joining the ranks of the healthy and vigorous.

Developing the national economy is a systems engineering activity, and the constraints that are imposed on it by the electric power bottleneck are mostly advance constraints. For example, China's railroads are not only limited in number, but also have low technical standards and limited haulage capacity. There is an urgent need to build new electrified lines and to electrify existing lines. But if the regions that need new or reconstructed lines cannot find the needed electric power, there will be no way of making a start with this railway electrification. In the 20 years during which China has experienced power shortages, there must have been many such cases of construction projects that were not built or that were built late.

The other adverse effects of the electric power bottleneck are mostly visible and tangible.

First, power cutoffs and cutbacks have caused immense losses of industrial output. Everyone knows that without electric power to drive it, almost all modern production equipment becomes incapable of functioning. But in the

priorities for electric power cutoffs and cutbacks that the power supply planning offices throughout the country have set up, it is industrial power users that bear the main impact. In Guangdong, electric power shortages result in a loss of power for three or even four days a week, and as a result, 30 percent or more of productive capacity is idled. It is estimated that at least a third of the country's productive capacity stands idle as a result of power shortages. Comrades of the Ministry of Electric Power state that our annual electric power shortfall is about 15 to 20 percent. In 1992, for example, the total electric energy shortfall for the year was between 111.7 and 148.9 billion kWh. If we assume that each kWh used by industry represents an output value of 4.9 yuan, then last year the country lost between 547.33 and 729.61 billion yuan of output. This constitutes an immense economic loss.

In addition, electric power cutbacks cause harm to electrical equipment, product quality, and production management. In certain industrial and mining enterprises, even if conscientious preparations are made after receiving notification of a power shutoff, some harm to equipment and products is unavoidable.

In addition, serious power shortages also affect China's opening to the outside. Experience with the development of China's "three capital" enterprises shows that a sufficient supply of energy is an important precondition for attracting business and capital. Other conditions being equal, foreign investigators always "go where the lights are on." The Shenzhen Special Economic Zone, the first to be developed in this country, has consistently taken emergency measures to assure a sufficient, uninterrupted supply of electric power. In addition to buying electricity from Hong Kong, at the end of 1991 alone it commissioned 10 small fossil-fired power plants (which are very uneconomical) with a generating capacity of 500,000 kW, investing more than 1.6 billion yuan for the purpose. Even so, electricity shortages put a great deal of pressure on Shenzhen.

Electric power shortages cause a great deal of inconvenience in the daily life of the masses and have an adverse effect on the prestige and credibility of the party and government. Initially, the reform and opening to the outside caused a great improvement in the people's standard of living, with televisions, refrigerators, electric fans and the like finding their way into homes. But the numerous electric power cutoffs and voltage cutbacks have rendered televisions and refrigerators unusable and have made fans into nothing more than decorative objects. People who want to read have to light candles. Many complain that "the power goes off when it's time for supper; the power comes on when it's time for bed," and basic-level cadres frequently report to their superiors that "when the lights go off, the family quarrels start."

Serious electric power shortages also create organic imbalances in electric power production, leaving behind a variety of hidden problems:

- Electric power is a special commodity, whose production and consumption must proceed at the same pace. In order to deal with increases in load, sudden malfunctions, decreases in hydroelectric power output during the low-water season, and the stoppages for routine inspection and maintenance of the equipment, the power grid must maintain a certain reserve generating capacity, usually equal to 25 percent of the total installed capacity (in Hong

Kong the figure is between 40 and 50 percent). This is similar to the practice of having reserve troops in wartime. But because of excessive electric power shortages, all available forces have to be thrown into the breach: the reserve generating equipment too, has to be put into action. Therefore, equipment that needs inspection and maintenance does not receive it in timely fashion, and some essentially deficient generator sets are forced to keep operating, which not only has a severe effect on the "health" of the equipment, but also leads to a pronounced increase in equipment malfunctions and breakdowns and results in large numbers of above-plan temporary equipment stoppages. The loss of electric energy output as a result of temporary stoppages of generating units with rated capacities of 100 kW or more was 28.4 billion kWh in 1989, 30.1 billion kWh in 1990, and 29.4 billion kWh in 1991, roughly equivalent to 6 million kWh of capacity a year (assuming 5,000 generating hours a year).

—In order to maintain the normal economic and technical service life of generating equipment (25 years for fossil-fired generator sets and 50 years for hydroelectric sets), according to international standards, the annual operating time of the equipment must be 5,000 hours or less (there is a total of 8,760 hours in a year). In such developed countries as the United States, the UK, France, Germany, and Japan, the figure is 4,000 hours or less, and in Hong Kong it is between 4,380 and 4,730 hours. But because of China's low per capita installed generating capacity and the need to produce more electric power, the annual operating time of generating equipment in this country is the highest in the world. Since the Fourth 5-Year Plan, the annual operating time of fossil-fired generating equipment in this country is universally about 6,000 hours. In 1990, the annual operating time of equipment at Shajiao A in Guangdong, of the power plant at Huangpu, and of major power plants elsewhere was over 7,000 hours, and the equipment at the Maoming power plant actually was in operation for 8,046 hours per year. In recent years, the electric power departments have become aware of the seriousness of putting the equipment at risk, and in addition, there has been a rather large increase in newly commissioned equipment, so that a resolute effort to rectify this unscientific, "exploitative" operation has been called for. But the electric power shortage is so severe that the annual operating time of generating equipment has still failed to decline significantly. It was 6,011 hours in 1987, 5,907 hours in 1988, 5,716 hours in 1989, 5,413 hours in 1990, 5,451 hours in 1991, and 5,462 hours in 1992. The consequences of this long-standing failure to give the equipment some rest can only be a shortening of operating life and an increase in latent problems, which constantly endanger the safe and stable operation of the power grid.

—Replacement of the old by the new is a universal law, but because of the long-standing electric power shortage, some outmoded equipment that cannot be retired on schedule. In China's power grid, about 33 million kW of medium- and low-voltage generating equipment is in need of thorough overhaul or modernization, and in addition, 7 million kW of seriously defective hydroelectric equipment and 6 million kW of superannuated heat supply equipment is still in operation. The country's rural low-voltage power distribution system is obsolete everywhere, and even Tian'anmen Square's power supply lines,

which went into operation in 1959, have not been modernized. All of these factors adversely affect the safety, reliability, and economic performance of the power grid.

"Three feet of ice takes more than a day to freeze." It is inadequate investment in electric power and an inadequate scale of capital construction that are the true causes of the power shortage. An "extraordinary acceleration of development" is an approach that offers a hope of alleviating the electric power bottleneck.

In the late fall of 1991, Energy Minister Huang Yicheng visited Hunan and Hubei provinces to inspect the status of electric power construction. During his visit, the province governors asked him for more electric power, and so did the mayors. Even his former neighbors from his hometown of Zaoyang, who made a special rush trip to see him, asked him point-blank for more electricity. As the person in charge of China's energy industry at the time, Huang Yicheng had a clear awareness of the basic factors responsible for Central China's energy shortage. He said, "Central China's energy shortage is no accident: it is entirely due to an inadequate scale of capital construction for the power industry."

Actually, this penetrating conclusion applies equally to all parts of the country that have power shortages, and to China as a whole.

"To increase oil output, you have to drill wells; to increase power output, the key is to install equipment": this unadorned statement by old power industry hands is an incontrovertible truth.

The basic characteristic of the electric power industry is that it uses an extensive form of expanded reproduction to increase its power generating capabilities: the annual increase in its ability to produce electricity is equivalent to the number of kilowatts of equipment capacity that it adds during the year. But to meet the continually expanding requirements of the national economy and the people's livelihood, the power industry must maintain a coordinated proportionality between supply and demand. This is a measure of whether electric power development is forging ahead, keeping pace, or falling behind.

A commonly used yardstick worldwide is the "electric power elasticity coefficient," i.e., the ratio of the annual rate of increase in electric power generation to the rate of increase in total industrial and agricultural output value. When this coefficient is equal to 1, the increase in electric power generation and the growth of the economy are keeping pace with each other; if it is greater than 1, electric power is indeed "leading the way"; and if it is less than 1, this is cause for concern, because numerous power cutoffs and cutbacks are unavoidable. In China, since the 1970's there has never been a year in which the electric power elasticity coefficient reached 1. For the most part it has been between 0.7 and 0.75. Even in the seven-year period from 1986 to 1992, when both installed generating capacity and the output of electric energy rose rather rapidly and when in addition there was a three-year period of management rectification, the average electric power elasticity coefficient was still less than 0.9. The value of the coefficient for Guangdong Province during the Sixth and Seventh 5-Year Plans was respectively 0.56 and 0.76. With such low values of the elasticity coefficient, it would be surprising if power shortages did not occur.

Another widely used yardstick is the ratio of power-producing to power-using equipment, i.e., the ratio of installed power-generating capacity to the capacity of equipment that consumes electric power. If the supply and demand of electric power are in balance, the ratio should be 1:2, indicating that during the period in question, power generation capabilities were sufficient to meet electric power demand, and no power shortage existed. When the ratio is less than 1:2, power shortages will occur. The smaller the ratio, the more serious the shortages. In China, the ratio was 1:1.91 in the 1960's and fell below 1:2 in the 1970's. From a value of 1:2.22 in 1980, it decreased to 1:2.54 in 1988, then fell further to 1:2.57 in 1989. From 1990 to 1992 the value of the ratio was consistently between 1:2.45 and 1:2.5. With the persistent low values of this ratio over a period of 20 years, serious power shortages and frequent power cutoffs are the natural result.

Some may say that we should take the long view and that, despite power shortages in the past and present, if the Eighth and Ninth 5-Year Plans are carried out, shortages may cease by the year 2000.

An authority from the power field replies that, based on economic statistics for the period since readjustment, the national electric power requirement in 1995 will be 920 billion kWh and that in the year 2000 will be between 1.34 and 1.47 trillion kWh. If 68 million kW of new large- to medium-size generating sets is commissioned during the Eighth 5-Year Plan, together with a few medium-to-small size generating sets, a capacity of 920 billion kWh could be attained by 1995. If an average of 20 million kW of large- to medium-size generating equipment capacity is added each year during the Ninth 5-Year Plan, then by the year 2000, national generating capacity will reach 307 million kW and the output of electric energy will attain 1.4 trillion kWh. Clearly, attaining this objective involves a great deal of difficulty in such areas as raising funds, obtaining equipment, and adequate progress in preparatory work, and also depends on a balance of various external conditions. Furthermore, even if the above objective is realized, the national power shortage will not necessarily be fundamentally alleviated. This is because, assuming a population of 1.25 billion in 2000, China's per capita installed generating capacity will be 0.24 kW and the per capita output of electric energy will be only 1096 kWh: this figure is far short not only of the per capita values of 26,000 and 18,000 kWh attained by Norway and Canada, but even of the figures of 2,000 to 6,000 kWh attained in Eastern Europe.

Consider also the following analyses.

At the end of last year, in the spirit of the 14th Party Congress, comrades of the Shandong Province electric power office set a specific target for "having electric power lead the way," involving effective management and utilization of the existing 10 million kW of generating capacity and the commissioning of an additional 10 million kW of capacity in the next eight years. Meeting this objective will be difficult, but it is a stirring undertaking. However, careful calculations show that if this goal were realized in the year 2000, Shandong Province's electricity shortage would still increase from the current 1.5 million kW to 3 million kW, and the relative size of the shortfall would be virtually unchanged.

Not long ago, after thorough consideration of electric power construction projects for the Eighth 5-Year Plan and the

power development program for the Ninth 5-Year Plan, the Beijing municipal electric power departments submitted to the municipal leadership a forecast that in the next seven years Beijing's electric power shortages will become more severe than they are today.

The above analyses are, of course, long-term concerns; but the next example involves immediate concerns.

Since last year, investment in the fixed assets of all state-owned units increased by 50 to 70 percent, but structurally, there was no tilt of funding toward the energy industries. In the last two to three years, electric power investments declined steadily: last year the investment in electric power was nearly 2 percent below that in the previous year. In the first half of this year [1993], investment levels in the transportation, posts and telecommunications, metallurgy, and building materials sectors showed a pronounced increase, and only energy investments received a declining share of total investment, falling by 2.9 percent, with investments in electric power dropping by 0.9 percent.

The central and local authorities have been slow in disbursing the electric power investments included in the state plan. In the first five months of this year, 40 percent of the year's investments should have been disbursed, but the actual figure was only 10.9 percent. This circumstance is unprecedented in the last 10 years and has caused certain electric power construction projects to be completely or partially idled.

The backlog of projects under construction has been steadily declining, so that the foundation of the electric power pyramid is not sound. Because electric power construction involves large investments and a long cycle (three to five years for a fossil-fired power plant and seven to 10 years for a hydroelectric station), there must be a great deal of advance work for power industry capital construction: the number of projects in the surveying and planning stage must be more than 10 times the number that had been given authorization; the number of authorized projects for which construction preparations are being made must be in a similar proportion to the number of projects actually under construction; and the number of projects under construction must be in a similar proportion to the number of projects about to be commissioned. Only in this way will it be possible to continue commissioning new power generating capacities each year. Regrettably, during the last few years, the ratio of under-construction generating capacity to capacity commissioned within the year has been declining steadily: it was 9:1 in 1990, 5.9:1 in 1991, and 5:1 in 1992; this year, it will fall below 5:1.

Both long-range and short-range concerns are being turned over in the minds of Minister of Electric Power Shi Dazhen and his four deputies. These top commanders, who have been inseparably connected with the electric power industry and who now shoulder the arduous responsibilities of China's electric power reform and development, took counsel together, and at a major Ministry of Electric Power meeting held on 28 May of this year they stated resoundingly that "if the electric power industry does not undertake an extraordinary acceleration of its development, it will be impossible for electric power to lead the way. In order for electric power to lead the way, the power industry must strive to make reform more thorough, because without reform no solution is possible."

Having electric power lead the way has been a consistent policy guideline of the central party authorities and the State Council. In 1953, in an annotation to the report of a party group in the Ministry of Fuel Industry, the CPC Central Committee stated that the coal, oil and electric power industries are the vanguard industries of the national economy. In the 1950's, Comrade Mao Zedong stated that electric power and transport facilities were the vanguard sectors. In 1985, while drafting recommendations for the Seventh 5-Year Plan, the CPC Central Committee stated that "the development of the energy industry must be centered on electric power." And in March 1993, in a political report delivered to the first session of the Eighth National People's Congress, Premier Li Peng stated that "we must vigorously develop the electric power industry." The statement of the Ministry of Electric Power leadership that in the future, the electric power industry must undertake "an extraordinary acceleration of its development" is consistent with China's conditions and with worldwide trends. In the course of gathering information for this article, I had the sense that the 2 million employees of the nation's power system are geared up for an extraordinary acceleration of the power industry's development, and that all sectors of the national economy, tired of electricity cutoffs and cutbacks, are eagerly looking forward to an early breakout from the electric power bottleneck.

The Light-Bringers: Pressing Forward Under a Heavy Burden

946B0022B Beijing RENMIN RIBAO in Chinese
12 Oct 93 pp 1, 2

[Article by RENMIN RIBAO reporter Zhu Jingruo [2612 4552 5387]

[Text] No developed country has power shortages, and no country with power shortages can develop. China has had power shortages for 20 years, and the people have been waiting 20 years for the electric power industry to lead the takeoff of other industries.

But the electric power industry bears heavy burdens, which are keeping it from taking off.

An annual increase of 12 million kW in installed generating capacity is insufficient to catch up with the increase in demand, and the annual electricity shortfall is still as great as 20 percent. The electric power industry has been operating at more than full load for 20 years, its equipment continues to be overburdened, and investments are inadequate; it lacks the capability to replace obsolete equipment, and damaged or defective generating sets continue to operate. In addition, a heavy debt of more than 90 billion yuan is making it difficult for state-owned enterprises, which are the mainstay of the power industry, to continue.

Western observers say that it would take a miracle for China's economy to achieve a growth rate of 10 percent or more with an 8 percent rate of expansion of the power industry. People in China's electric power industry state that "We are bearing up under every calamity and pressing forward under a heavy burden."

Operating at Full Load, Working at More Than Full Load

A visitor to the Beijing No. 1 heat and power plant has reason for amazement. Three large generating sets that were commissioned in 1958 have already exceeded their rated

service life by 150,000 to 200,000 hours. Starting in the 1970's, the quadrennial major overhaul has had to be replaced by an annual overhaul. Practically every assembly of the boilers, steam turbogenerators and main transformers has had repeated major repairs. When repair is no longer possible, they have been replaced one by one, so that by now all components have been replaced at least once.

In this large enterprise, which relies on its superannuated, aging equipment to provide power to a large part of the capital, overuse has caused cracks up to 82mm deep to form in the wall of the boiler steam jacket. The cracks have been patched by welding to keep the equipment operating. Wang Miao Cheng, who has been a duty engineer at the plant for 20 years, says that each day's work is done with his heart in his throat.

The operation of worn, superannuated equipment is by no means limited to this plant. Many generator sets that were commissioned during the First 5-Year Plan are still in operation. According to statistics from the Ministry of Electric Power, in the current power grid, medium- and low-voltage generating sets representing a total capacity of 33 million kW are in need of thorough renovation or modernization, and, in addition, 7 million kW of severely deficient hydropower generating equipment and 6 million kW of overage heat supply equipment is still in operation. If you take the road north from the Shanhaiguan Pass, you will see the sagging cooling towers of old power plants; if you touch them, you will find that their concrete coating is scaling off. When the head of the Panmian electric power office in Liaoning assumed his duties, he discovered that the tables and chairs used for office work were relics of the Japanese-installed puppet government, and that the first domestically produced main transformer is still in operation.

Maintaining reliable output amid a multitude of perils and maintaining a superior record of full-load operation have long been the daily reality in China's electric power industry.

In order to alleviate China's electric power shortage, the power industry has always taken full generation and full delivery as its guidelines. For 20 years, the industry and the electric power enterprises, like the Beijing No. 1 heat and power plant, have consistently been operating at full capacity, with no breathing space. The national average annual number of hours of operation of fossil-fired generating sets is 6,000 hours; some newly constructed power plants operate their equipment for 7,000 hours or more a year; and in a few cases, the length of operation reaches 8,000 hours, far above the international standard of 5,000 hours per year.

Behind this equipment-risking, exploitative mode of operation, to which there is no alternative, the electric power industry is also afflicted with inadequate equipment maintenance capabilities owing to depreciation rates that are below the national average. As a consequence, equipment overhauls must be extremely stringent and careful: they constitute a succession of intense struggles to gain a little more time and a little more quality. It is common for employees to work round the clock or to be on the job for a week without returning to their homes. A power plant director under the North China electric power office, who had spent several days and nights riveted to the site of a rush repair job, collapsed from exhaustion after the generating set finally rumbled back into operation.

An accident resulting from a violation of regulations at the Hefei heat and power plant shocked the Ministry of Electric Power. Four persons were killed. But the comrades of the investigating board could hardly bring themselves to take action. At the time, two generating sets at the plant were being overhauled, and a mass of coal slag suddenly became hung up in the one unit that was still in operation. If the generator had stopped, there would have been a major emergency. As a consequence, the plant directory and the operating crew put themselves in harm's way, trying to prod loose the suspended slag inside the hot furnace. The slag, at a temperature of over 1000 degrees, fell down and crushed them.

The situation in the power grid is even more difficult than that in the power plants.

The country's urban and rural low-voltage power distribution network is universally outmoded. A considerable fraction of China's old municipal power networks have been in operation for 25 years or more, and some have been operating for 40 years. The bustling city center of Shanghai is still using power distribution equipment left over from the 1920's and 1930's; 30 percent of the utility poles are at or above the maximum rated load, voltages are too low, and breakdowns are frequent.

In Dalian, Fushun, Shenyang, and Changchun, power distribution equipment left over from the Japanese puppet regime continues in use. In Beijing, emergency shutdowns caused by the aging power delivery facilities are almost a daily occurrence. The seriously aging power lines in Tian'anmen Square are now carrying five times the load for which they were designed. The insulation is peeling from wires that have been in operation for more than 30 years. Six years ago, the electric power departments proposed a program to replace this equipment, but it was shelved owing to lack of funding.

People not in the industry have difficulty in comprehending that every success in the onerous task of power delivery is ultimately the result of "human wave" tactics in which personnel at all levels pitch in together. When the Asian Games were held in Beijing, the electric power departments mobilized a huge "militia," posting one person at each utility pole between the power plant and the site of the games in order to assure timely detection and rectification of malfunctions.

Behind the full-load provision of light is an effort at more than full load by the machinery and personnel.

A Virtually Insurmountable Debt

Corresponding to the equipment that cannot be modernized is a mounting debt. At the end of 1992, the major state-owned enterprises of the Ministry of Electric Power had a debt of 96.7 billion yuan.

The fixed assets of the Ministry of Electric Power's East China Electric Corporation are the greatest of the country's 500 large enterprises, but the debt of the Northeast China power grid is fully 10.5 billion yuan, with an annual interest of 550 million yuan; the total operating profit of the power grid in 1991 was only 50 million yuan.

After decades of struggle and devotion by their employees, well-known large enterprises that provide the power on which other enterprises rely for survival are making insufficient profits to pay even a fraction of the bank interest on

their debts; they must wage an agonizing struggle to survive under their crushing indebtedness and its steadily compounding interest.

It should be noted that for several decades, the electric power enterprises were well off. But since the policy of replacing allocations by loans was instituted in the 1980's, and especially since the second stage of replacing profit payments by taxes was instituted, the tax rate on the electric power industry has been increased from 15 percent to 25 percent; the combination of a high tax burden, high operating costs, and low prices have made the state-owned electric power enterprises increasingly hard pressed.

As of 1990, the ministry's electric power enterprises were able to retain only 8.2 yuan of every 100 yuan of earnings. At the same time, prices for coal, oil, rail haulage and other transport were repeatedly adjusted upwards, and the prices of water, materials, and equipment rose steadily, so that the cost of producing electric power skyrocketed. In 1978, the cost of producing 1000 kWh of electric energy was 31.55 yuan, but by 1992 the cost of producing 1000 kWh in the Beijing-Tianjin-Tangshan power system had risen to 96.03 yuan; meanwhile, the prices charged for electric power remained basically unchanged.

As a result of high taxes, high costs, and low prices, in the course of a decade the profitability rate of funds in the state-owned electric power enterprises declined steadily, from 12 percent in 1980 to 3.7 percent in 1991. The enterprises' borrowed funds correspondingly lost their ability to generate earnings sufficient to repay principal and interest, and the indebtedness of the large state-owned enterprises mounted rapidly, at a rate of 15 to 20 billion yuan a year, snowballing into a loan that could never be paid off.

Since the bad practices of the old enterprises are so difficult to eradicate, can new construction projects bring about a beneficial cycle?

The repayment period for Gezhouba is 24 years, with an annual principal and interest payment of 300 to 500 million yuan, but the total profit of the Gezhouba power station since it went into operation has been no more than 200 million yuan. The Dahua hydroelectric station and the Heshan fossil-fired power plant, newly constructed in Guangxi, have made a significant contribution to alleviating the electric power shortage in the area, but the annual loan interest alone for the two plants is 150 million yuan while the annual profit of the entire Guangxi power grid is only 60 million yuan.

As the number of construction projects increases and as deliveries of electric power rise, the cost of producing power increases. As the contribution that the electric power enterprises make to the state and localities grows, the debt burden that they carry becomes steadily heavier.

The difficulty of achieving a beneficial cycle is casting a dark shadow over the development of the electric power industry. In the first five months of 1993, less than 11 percent of the funds allocated for power construction nationwide were actually disbursed. There are, of course, many reasons, but everyone is calculating economic benefits, and who is willing to pour money into a bottomless pit? The failure to increase construction affects not only the present, but the future as well.

We hope for a full supply of electric power as one hopes for rain clouds after a long drought.

Electric Power Quality: A Difficult Task

The burden of electric power enterprises is not limited to their debt of more than 90 billion yuan; another factor is the heavy sense of responsibility for improving the quality of China's overall supply of electric power.

In Japan, interruptions of electric power to users total less than two hours a year. In the United States, they are a maximum of five to eight hours a year, and likewise in Europe. In China, for many years there have been power shortages 15 to 20 percent of the time, and in some provinces even 30 percent of the time. The only way to deal with them is to cut off the power or to cut back the supply. In 1992, as a result of these stoppages, the country lost between 500 and 700 billion yuan of output value. And behind this calculable loss there is another hidden loss. A decline in the quality of the electric power supply as a result of excessive load and below-standard frequency slows down machine tools and causes unevenness of yarn in textile mills and fading of colors in dyeing plants. These phenomena directly affect the quality of China's manufactured goods, and the intermediate hidden loss involved cannot be expressed in numerical terms.

One year, a brilliant soccer game was being played in Shenyang. Just as one of the players made a kick toward the goal, the electric power suddenly went off. Shenyang went dark, the live broadcast stopped, and soccer fans all over the country were enraged.

In Sheqi County, Henan, on one occasion the peasants left their wheat fields and walked 10 miles to burst into the electric power office and demand electricity. The conflicts of the energy shortage are concentrated in the electric power departments. In Guizhou, in order to maintain the prescribed frequency and to assure grid safety, a scheduler acting under orders from his superiors cut off the power to an enterprise that used excessive amounts of electric power. As a result, he was arrested and charged with "sabotaging production."

In response, the electric power departments have done everything possible to resolve conflicts in a realistic spirit of "Don't wait, don't rely on others, don't bear a grudge," and have displayed profound understanding of society's "lack of understanding." From the original Ministry of Energy to the present-day Ministry of Electric Power, they have treated the work of supplying urban and rural dwellers with electric power for their daily needs as a matter of "promoting stability and unity and motivating the masses to build socialism." On two occasions they have issued regulations on maintaining the supply of electricity for daily needs and for lighting to the urban and rural populace.

Assuring lighting means putting pressure on industrial production, which is a matter that requires infinitely painstaking planning.

A tiny power-management office in the town of Niudu, Linyi County, Shanxi, created an approach that later was widely disseminated. At the time when the populace was making its peak use of electric lights, the office shut off nondomestic power supplies to assure that light would be available, and at the peak period of power consumption for purposes other than lighting, it made all possible efforts to

assure that power would be available for production. It signed notarized electric power contracts with the users. The power supply office in Fucheng County, Hebei, made even more detailed regulations and installed meters to keep track of power use in periods when limitations were imposed. The local problem of "having the power go off just when dinner was served and seeing the sign-off when you turned on the television" was set right. The leadership and rank-and-file of many power industry offices in the country not only have a thorough knowledge of the industry, but are conversant with the circumstances of the local enterprises, services, and units. In addition to managing electric power effectively, they cannot avoid becoming involved in arranging social life as a whole. China's electric power industry and its personnel truly are called upon to shoulder too heavy a burden.

Don't wait, don't depend on others, don't bear a grudge. Put out all your strength and effort, assure that the existing facilities are used with high efficiency. This spirit is precious and commands respect. It is this spirit of putting up with humiliation to perform one's mission and of continually driving oneself that supports China's ability to use its 8-percent rate of increase in electric power output to provide light and heat for a 10-percent growth rate of the national economy.

But we can also see that the call for the power industry to get into a beneficial cycle is essential to assuring the sustained, stable, rapid development of China's economy.

Electricity Prices: How Are We To Understand Them?

946B0022C Beijing RENMIN RIBAO in Chinese
20 Oct 93 pp 1, 2

[Article by RENMIN RIBAO reporters Tang Liliang [3282 2621 2733] and Wang Haiyong [3769 3189 0737]

[Text] Electricity prices are a subject that urgently needs examination.

Opinions on the subject vary. Some people are satisfied: This year everything else is going up, but household-use electricity prices are steady. The price of household electric power in the Beijing region is 0.164 yuan per kilowatt-hour (including a municipal public service fee of 0.14 yuan which goes into local revenues). This was the price in 1958 and this was the price in the first half of this year.

Some people complain that state-set electricity prices are too low, and that there is an urgent need to raise them. Some people are angry: "Going up again? It's costing us about a yuan per kilowatt-hour already. Is there any rhyme or reason to it?"

Some people sound a warning note: "There's already a lot of pressure to raise everything, so they shouldn't be in any hurry to raise electricity prices."

Some people are impatient: "I'm not in the mood to talk about the price of electricity: what I'm concerned with is the power shortage. The power's just on and off here. Why doesn't the state put a little more effort into it?"

Everybody thinks that he is right. In the past few years, the reform of the price of electricity has made some progress and has taken a few steps. The program for more thorough reform of electricity prices that was issued this July resulted in a rise in household electricity prices, which had been

steady for several decades. It, too, brought forth a chorus of differing opinions. Just what are we to think about electricity prices?

If State Electricity Prices Are Not Adjusted, the Electric Power Industry Will Lose Money Across the Board

The electric power industry relies on the extensive form of expanded reproduction: the more power you want to generate, the more equipment you need; and the more equipment you need, the larger the investment that is required. Where does the investment come from?

That the electric power industry should rely primarily on the funds that it accumulates itself and should engage in self-supporting development is a basic principle of electric power development throughout the world. In Japan, 80 percent of the funding for the expanded reproduction of the 10 largest companies is furnished by the companies themselves.

But countries differ greatly in their circumstances. China's centrally subordinate power companies had a debt of fully 96.7 billion yuan at the end of 1992 and the amount is rising at a rate of more than 10 billion yuan a year. This crushing burden gives them no breathing space.

The principal cause of the problem is the price of electricity.

Up to 1985, power industry construction in China was supported primarily by the central authorities, and the electricity price structure was uniform, with the prices set by the state (i.e., directive pricing). When the prices of fuel and transportation were raised, there was a corresponding rise in the price charged for electric power; thus, state-specified prices for electric power, which had not previously been adjusted, rose somewhat.

Although the rise in the price of electric power compensated most of the great increase in power production costs that was brought about by increased fuel and transportation prices, the contribution of materials and equipment to power production costs had to be covered entirely by the enterprises themselves, and, as a result, the full cost of power production was still not adequately compensated by the price of electricity. In 1992, the cost of producing a kilowatt-hour of electricity in the centrally subordinate power companies was 2.5 times what it had been in 1980, but the average price charged for electricity had increased by a factor of only 1.3. As a consequence, the profit on each unit sold had decreased by 50 percent. The profitability rate of funds was 14.5 percent in 1985 but only 3.13 percent in 1992, far lower than the current Construction Bank interest rate on loans for electric power construction (11.16 percent for periods of five years or more). All of the earnings so arduously accumulated by the centrally subordinate power companies were inadequate to cover even the interest on the loans. Under last year's conditions, they lost nearly 20 yuan on each 100 yuan of expenditures. Since they were unable to accumulate funds, an infusion of funds from outside was unlikely.

After the policy of replacing state allocations by loans was instituted in 1980, it was long impossible to recover electric power construction funds invested by the central authorities, and it became increasingly difficult to increase investments in electric power. In 1991, investments by the central authorities had fallen to 45.6 percent of total national investments in capital construction for electric power, compared with 81.6 percent in 1985.

Borrowing money from banks was even more difficult. Recently, new bank loans, even for state key electric power

construction projects, often required a great deal of coordinating work by the relevant departments before the banks could be induced to agree. It is not surprising that the banks were unwilling to provide the money, because the power companies were not in a position to repay it. By the end of 1991, the bank debt of the electric power industry had reached 30.9 billion yuan.

In 1992, when the World Bank voted on the evaluation of the Zou Xian (Shandong) power plant project, the U.S. representative abstained; one of the chief reasons was that the price charged for electric power was too low.

To compensate for the inadequate investment in capital construction for the power industry, between 1988 and 1991 the Ministry of Electric Power was authorized to issue more than 7 billion yuan in bonds of various types to the public; the accumulated capital and interest on these bonds was more than 10 billion yuan. This year, with repayment at its peak, more than 6 billion yuan is required. Unless new prices for electricity are instituted, where will this more than 6 billion yuan come from? If the industry cannot pay off its old debts, how will it be able to issue new bonds?

The time has come for adjustment of the seriously inadequate directive prices for electricity.

The Climate Is Excellent for Raising Funds for Electric Power; Prices Are the Key to Loan Repayment

In view of the threadbare state of the centrally subordinate electric power companies, in 1985 the central authorities issued a new policy encouraging more organizations to produce power and instituted diversified electricity prices. As a result, the Huaneng group went into the power business, localities invested in power production, and joint power production bodies sprang up vigorously, producing an excellent situation. The key to raising funds for power production is "loan-repayment" power prices, or, in other words, prices sufficiently high that the power companies will be able to repay their loans and interest on time: these are "guided" rather than directive prices. This pricing system not only gave the investors access to electric power, but assured them of profits when the loan and interest were repaid. When the policy of diversified electricity prices was instituted, there was an abundant influx of funds: the diverse electricity prices policy not only made the Huaneng Group, which used primarily foreign capital, essentially capable of self-sustaining growth, but also brought about a burst of enthusiasm for local power production. In 1992, generating sets for which the investment funds came from the localities, enterprises, and foreign capital accounted for two-thirds of all newly commissioned sets nationwide.

Electricity is a unique commodity. It cannot be stored and it must be consumed as it is generated, and thus optimized power grid layout and scheduling are needed in order to achieve the maximum economic effect from the generation and circulation of electric power. It must be admitted that the policy of allowing fund raising for power production promoted the development of the power industry, and revealed a new mechanism for power generation, and has resulted in successful experience. But we now know that before the new situation had taken shape, uncoordinated efforts to raise funds and go into power production also led to abuses. The investors called the tune and tended to emphasize their own particular benefits, which in turn sacrificed the overall interests of the power grid, so that it

was difficult to assure optimization of the power grid and implementation of state energy policy.

But why should we not make this sovereign remedy of loan-repayment pricing available to the centrally subordinate power-industry departments, so that they too will have the clout to raise funds for power production?

Experience Shows That the People Can Bear Electricity Price Reforms

A rise in the centrally controlled power companies, which account for 70 percent of the national total, will not be a trivial matter. The power industry is a basic industry, and if the prices charged by a basic industry are adjusted, price rises throughout the economy may result, and the people's livelihood may be affected. The state is taking a cautious approach to such matters. At present, the prices of coal and of most other raw materials, as well as the prices of grains and edible oils, have been allowed to float, and electricity price reform is bringing up the rear.

But just how great an effect will changes in electricity prices produce?

It is calculated that, given the fluctuations in the prices of coal and transportation, if loan-repayment prices were instituted in one step, the national average price of electric power would have to increase by only 34 percent above the 1992 price, or about 0.05 yuan.

Assuming that a family of three consumes 60 kWh of electricity a month, an increase of 0.05 yuan per kWh would mean an additional outlay of 3 yuan per month, equivalent to one serving of ice cream per family member.

In the case of the enterprises, an adjustment of the price of electricity would have a large effect only on those with high power consumption, but these represent only a small fraction of all enterprises nationwide, and since their product prices have already been allowed to float and to come into line with international market prices, they are fairly well situated to bear an adjustment of the price of electricity.

In certain economically developed regions with significant power shortages, people are well acquainted with "high electricity prices." To meet the needs of economic development, these regions have made extensive use of small fossil-fired power plants. The fuel consumption of these plants is an order of magnitude higher than that of large fossil-fired plants, and the prices that they charge for electricity are correspondingly higher. Guangdong Province has 1 million kW of kerosene-fired generating equipment, and the cost of the electricity produced by these plants is as high as 1 yuan per kWh. Shenzhen instituted new prices for electricity as early as 1989, and users all stated that the price reform was necessary and that they could tolerate it. Experience shows that the more highly developed a region's economy, the greater the ability of the users to tolerate increased electricity prices.

Adjust Electricity Pricing, But Rectify It Well

Electricity prices vary from place to place; this is acceptable, because at present the distribution of primary energy resources is not in balance (electricity produced by fossil-fired power plants is a secondary energy resource that has been converted from coal and other primary energy resources). If loan-repayment electricity prices are instituted, a rational average nationwide electricity price level

would be about 0.30 yuan per kWh; a price level of 0.5 to 0.6 yuan would be very high. At this point, some readers may exclaim, "Our electricity prices are well above that!"

It is true: in many areas of the country, primarily rural areas, the prices that users are actually paying for electricity have long exceeded the loan-repayment price. It is reported that rural electricity prices on Hainan Island were rectified, lowering them from 1.35 yuan to about 0.8 yuan per kWh. The highest prices on rural Hainan Island exceeded 4 yuan per kWh. Excessive prices for electricity have forced the peasants in certain areas to go back to oil lamps in place of electric lights.

Why is it that these electricity prices are so much above the standard? While in some locations power generation costs are indeed very high, the primary reason is that electricity price management is chaotic, and, in particular, that guided electricity prices are out of control in some localities.

There are more than 10 state-approved categorized guidance prices for electricity. Many provinces and municipalities implement an overall use surcharge to guidance prices, in which the price excess above the directive prices is spread out over the power use of the entire area. Because most of the income from guidance prices for electricity is available for local distribution, if local governments at various levels approve guidance prices, the result may be the setting of high prices, price increases at each level, and collection of increased fees for electric power. Because electric power payments are easy to collect under the rubric of fees, a great variety of local policies involving "piggyback" fees have emerged: "Surcharges are a basket that you can put wherever you need it." Some localities even include birth control fees, highway construction fees and entertainment fees in the price of electricity. There are also cases when electricity fees for goodwill, influence, and connections are imposed on users. Thus electricity fees have become a catchall for a multitude of charges. In one city, the combined price rise included fully 35 components. One fee collector told a reporter: "It used to be that when you collected the electricity fee, you wrote out a bill; now you write out a whole stack of them."

The director of the Guomian No. 3 power plant in Jinan said angrily, "The enterprises are paying more money for electricity, but is this money really being used to support power-industry construction?"

The electric power departments also have their complaints. Director Qi Xinpei [2058 2450 1014] of the Jinan Power Supply Office stated: "Some users are accusing us of disguised robbery, but they don't realize that we are actually collecting the money for others: we're just the scapegoats."

It would appear that while adjusting electricity prices, we should also rectify pricing and prescribe uniform electricity price management standards. Otherwise, a plethora of "electricity tigers" will open their jaws, and the situation will become intolerable for everyone.

Electricity Prices Will Not Rise Sharply

A kilowatt-hour of electricity can be used to produce several yuan or even several dozen yuan of industrial output value, but its price is only a few hundredths or tenths of a yuan. Those who understand the situation consider that the time has come for price adjustment.

There has been some psychological preparation for the adjustment of electricity prices. Many plant directors have stated that so long as they get enough electricity, they will put up with any price in preference to power outages.

Many members of the public state that they would prefer air conditioning to low electricity prices. But some comrades are concerned that since the electric power industry is highly monopolistic, if electricity prices are allowed to float, they might rise precipitously. This concern is unwarranted, however. Although the power industry must adapt to a market economy, it is a public utility; all countries have strict electricity pricing principles, and as public utilities, the power companies are not permitted to earn high profits. What profit rate is suitable for electric power enterprises? Experts believe that in this country, an average profitability rate of funds in the range of 12 to 15 percent would promote the self-supporting development of the electric power industry. Head of the Ministry of Electric Power's pricing office Huang Yongda [7806 3057 6671] believes that, "In the future, China should adopt a funds profitability model when evaluating and adjusting electricity prices."

This July, the State Council approved a new electricity price reform program which raised the standards for price increases based on the costs of coal and transportation; in addition the central authorities took the initial steps toward loan-repayment prices and approved the first increases in household electricity prices. Furthermore, the accumulated price rises based on the cost of coal and transportation will be combined in the list price for electricity, providing an excellent basis for the rationalization of electricity prices. We are told that in the next few years, the Ministry of Electric Power plans to reform the procedure for increasing prices on the basis of coal and transportation costs, to implement loan-repayment pricing across the board, to institute peak and off-peak electricity pricing, and ultimately to arrive at rational pricing. Electricity prices are the lifeline that will bring the power industry to a beneficial cycle.

Aristotle stated, "Give me a place to stand and I will move the earth."

A high official in the Ministry of Electric Power stated: "Give us the electricity price lever, and we will make the power industry take off."

The Huaneng Group: An Attractive New Mechanism

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[Article by RENMIN RIBAO reporter Yang Yong [2799 8673]

[Text] Eight years ago, when the Huaneng organization was first created, very few had high hopes for it; but its organizers planned to use the excellent opportunity provided by reform and opening to the outside, together with state funds for replacing oil consumption by coal consumption, in an attempt to take a new approach to power production. Top officials of the State Council gave it their vigorous support.

In eight years, the organization has succeeded and has snowballed into China's Huaneng Group, whose central activities include the basic industries of electric power production and coal.

After eight years, Minister of Electric Power Shi Dazhen says that the entire electric power industry should follow the Huaneng Group's lead.

The Huaneng Phenomenon: A High Starting Point, High Speed, High Standards, and High Benefits, Exemplifying the Best, the Most Successful, and the Most Valuable

The first stage of Huaneng's Shidongkou No. 2 power plant in Shanghai, with two 600,000-kW supercritical fossil-fired generating units, was imported from the United States and Sweden. Eighteen large Chinese enterprises from various sectors participated in its design, construction, installation and adjustment, and the high degree of automation of generating set operation and control and the overall high technological standards not only make the plant a pace-setter in this country, but put it on a par with the world state of the art. Its high-efficiency operation and low coal consumption continue to be astonishing. This exemplifies the high starting point of Huaneng projects.

At Huaneng's Dezhou power plant, two domestically produced 300,000-kW generator sets were connected into the grid and started producing power within a year; its Fuzhou and Dalian power plants, with imported 350,000 kW generator sets, were built and put into operation in only 24 months. In the past, the domestic construction cycle for a power plant of this size was usually about three years. This exemplifies the high speed of Huaneng's construction projects.

According to previous state staffing standards, Huaneng's Dalian power plant should have required a staff of about 1,200; but Huaneng followed foreign management models and specified a staff of 488. After the plant was commissioned, this staff was decreased to 443 in 1991, and to 308 in 1992, and is now 280, but safe, high-efficiency operation is maintained throughout the plant, and it is a leader in many performance indicators. This exemplifies Huaneng's high management standards. At Huaneng's Shang'an power plant, the more than 150 persons who engaged in a concurrent construction and modernization effort brought the plant rapidly to full output and posted a high labor productivity figure of 240,000 yuan for all personnel. This exemplifies the high benefits obtained from Huaneng's operations.

Every one of Huaneng's power plants has some unusual features.

This is the attractiveness of the Huaneng Group. It has posted record after record for power plant construction and management in China.

In addition, it has written a brilliant page in its own history.

The organization of the group is as follows: it has 11 component corporations and nearly 200 component enterprises.

Its total capital has increased from less than 2 billion yuan at registration to a current value of 39.9 billion yuan.

The group's installed generating equipment includes a completed or under-construction capacity of more than 17 million kW, with 1.5 to 2 million kW of capacity commissioned each year; this year it will contribute about a fifth of the country's newly commissioned capacity. Over the course of three years, its generating capacity has increased by a factor of 1.9.

Its profits were 270 million yuan in 1989, 480 million yuan in 1990, 660 million yuan in 1991, and 1 billion yuan in 1992.

With the large and medium-size state-owned power companies limping along, how is it that Huaneng is able to stand head and shoulders above the rest?

Huaneng's Advantage: Two Strong Legs from Birth, Use of Investments and Financing Strength To Increase Its Vigor, Rational Electricity Pricing that Moves It Rapidly Toward the Market Economy

When head of the North China Power Industry Management Office Jiao Yi'an [3542 0310 1344] discussed the key factor responsible for the difficulties that the large and medium-size state-owned electric power enterprises are experiencing in stimulating their vitality, he frowned: "They lack investment strength, financing strength, and rational prices."

This is the common problem of all state-owned electric power enterprises.

They all express interest in the Huaneng mechanism.

This is because Huaneng has taken a step forward. An official of the group stated: "We benefited from the policy of reform and opening to the outside." There is no question that this policy gave Huaneng vitality and provided it with two strong legs, so that from the beginning it has been able to stride powerfully ahead and advance toward the market-economy path.

To start, Huaneng created an operating mechanism which was basically suited to the socialist market economy, and in the course of its development, it has made use of special state loan funds, relevant state policies, and its "four autonomies" (independent operation, independent profit-and-loss operation, self-development, and self-restraint) to strengthen itself continuously, making itself a leader in China's reform of the basic-industry investment system.

Huaneng has investment and financing strengths. It combines the motivated character of local power generation, domestic raising of funds, the accumulation of funding from a variety of sources, and collective power generation, and it promotes safe and effective project implementation and enterprise operation. It can attract extensive foreign capital and can be selective on international financial markets. It carries on combined commercial, technical, credit and trade negotiations, thus transacting a great deal of business at a small cost. We recall that in the group's early days, a certain domestic power plant paid US\$199 million to import two 350,000-kW generator sets, but Huaneng paid only \$183 million, and in addition it bought \$30 million worth of spare parts and obtained rather low loan rates.

The group charges electricity prices that are basically consistent with the law of value: the state permits it to adjust prices as necessary. Huaneng's main funding sources are state special-project loans, foreign capital, and domestically raised funds, in approximately equal proportions, all obtained on a compensation basis: Huaneng is both the borrower and the repayer, and it is the entity that enjoys the profits or bears the losses. In its domestic construction loans, the interest rate is in line with construction industry standards; its foreign capital is borrowed at international financing interest rates. In addition, the materials used on its construction projects and the materials and fuels that it

uses for power production are mostly procured on the market at a negotiated price. Were it not for Huaneng's relatively rational electricity pricing, its enterprises would not be able to survive, to say nothing of carrying on expanded reproduction. The formula is: a loan and interest repayment component, a high-priced materials component, and a fixed, rational profit. Ultimately, the group must maintain a certain expanded reproduction capability to provide it with staying power.

If these two strong legs could be grown by all state-owned electric power enterprises, the power industry's growth rate probably would be more than a mere 8%.

The Huaneng Mechanism: A Strong Loan Repayment Orientation and Close Ties of Each Individual to His Job as Prerequisites to Overall Vitality

Huaneng's overall size is huge: its total worth is 39.9 billion yuan. But only about 10 percent, or slightly over 4 billion yuan, is the amount that actually belongs to the group; more than 35 billion yuan represents debts, both foreign and domestic. Thus Huaneng is operating under debt.

It is carrying an immense burden.

Although Huaneng's debt repayment capacity is already 3 billion yuan a year, its newly undertaken debt is also equal to 3 billion yuan.

Since it needs both to lighten its debt burden and to take on new burdens, Huaneng is developing dialectically and this way is producing both benefits and electric power. Its characteristic feature is that pressure and dynamism stimulate each other and that interests and risks constrain each other.

Huaneng established a management model in which investment and operations are integrated. Thus a situation in which "others borrow the money and we have to pay off the debt" can never occur under this model. Huaneng gives the onerous term "repayment" a new interpretation: operation under debt and the market risk mechanism prompt it to give top priority to investment benefits, with forward and backward continuity of borrowing, investment, construction and operations during each step. Fortunately, Huaneng has an independent operations policy: the state approves the projects and puts together the financing package, but Huaneng calls the tune in all other respects; the only requirement is that it produce benefits. Here are two examples. When a coil failed at the Fuzhou power plant, the company immediately contacted the civil aviation department and rented an airplane to bring a replacement coil from Japan. Was it worth the cost? Yes, because one day's stoppage of the power plant meant a loss of 700,000 yuan, and the stoppage of a week that is common practice would have been entirely intolerable. Again, every day's delay in the commissioning of two 350,000-kW generating sets means a loss of US \$50,000 together with the payment of 50,000 yuan in interest; thus, in order to shorten the construction time and increase benefits, Huaneng has instituted bonuses for completion of construction ahead of schedule. For some plants, the construction organizations can obtain a bonus of 100,000 yuan for each day that the construction is completed ahead of schedule.

Huaneng has an effective and vigorous internal operating mechanism whose unique property is that the group is

bound together by property relationships; the central company and the component enterprises have a mother-daughter relationship or a controlling-interest or partner relationship. Other than the Huaneng International Electric Power Corporation, which is a Chinese-foreign joint capital operation, the Huaneng group guarantees a graduated rate of remitted profits to the higher levels, in which the percentages of excess earnings that are allocated to the total contract amount and to total wage are linked to the amount of profits tax paid, the amount of electricity generated, and the amount of coal transported, with an effort to move into line with international practice. Each year, the corporation pays a graduated rate of 10 percent of profits to the government, higher than the 7.2 percent rate paid by the Shougang Iron and Steel Works; the enterprise and the state divide the remainder in 30:70 proportions. If the company's profits increase by 1 percent, wages are increased by 0.7 percent. Close profit-and-loss relationships between the company and the state, the enterprise and the group, and the employee and the enterprise have been set up. The human factor has been assigned a highly rational part in the development of production. Production relations have been streamlined, thus guaranteeing the group's strong market competitiveness.

Huaneng's Path: Still Expanding, Standing the Test of the Steadily Improving Socialist Market Economy, Continually Improving Itself

Basic-industry projects involve large investments, long construction times, low profit rates, and a slow return on investment, and they must have a relatively stable source of funding if smooth progress on the projects is to be assured. In the eight years of Huaneng's operation, in addition to using foreign capital and locally raised funds, it has relied for its construction funds primarily on loans for the replacement of oil by coal. Starting this year, because the state has decided to "bring oil prices into line once and for all," these loans have been greatly decreased, and many projects currently under construction face the danger of suspension or stretching out of the investments. This year, the size of the scheduled state loan to Huaneng for replacement of oil by coal was 2 billion yuan. Ultimately it will be able to disburse only 900 million yuan, but the amount actually disbursed in the first half-year will be only slightly more than 200 million yuan. Thus Huaneng too is facing a funds shortage.

Huaneng therefore laid its emphasis on opening up direct and indirect financing channels. It is now making arrangements for the establishment of experimental joint-stock enterprises and is arranging for the existing Huaneng Finance Corporation to have expanded functions. It has vigorously sought cooperation with international investment groups and has opened up more funding avenues. In May of this year, the Russell 20/20 Group, which is the largest retirement fund in the United States, visited China and reached an agreement in principle to enter a power-generation partnership with Huaneng. The Huaneng International Electric Power Development Corporation has also discussed joint-capital power generation with investment groups in the United States and Hong Kong; it is currently organizing some of its plants in Shandong into a joint-stock corporation for entry into overseas markets; and it has opened new channels that will allow it to utilize foreign capital.

Huaneng's new objective in power generation is to install 15 million kW of new generating capacity by the year 2000 and

to help the country free itself from its severe stagnation in electric power, so that this vanguard sector can truly break out of its bottleneck and move ahead.

Electricity From the Northwest

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1 Nov 93 pp 1, 4

[Article by RENMIN RIBAO reporter Ao Teng [0277 7506] and New China News Agency reporter Qu Zhenye [4234 2182 2814]: "Electricity from the Northwest: A Report on Power-Industry Construction in Nei Monggol"]

[Text] Nei Monggol's electric power industry is developing rapidly, and the Beijing-Tianjin-Tangshan and Northeast China regions are continuously obtaining electricity for lighting and heat from Nei Monggol.

Power Shortages: An Opportunity for Electric Power Development in the West

China's power shortages have continued for many years, and in particular, since a new round of rapid economic development began, the sluggishness of the electric power industry has become increasingly serious.

When the state announced the policy decision that the country's energy development strategy should shift toward the West, the party committee and government of the Nei Monggol Autonomous Region wasted no time in setting the guidelines of making coal-fired power production the pace-setter and having the power industry stimulate both coal industry development and the comprehensive development of the economy. Nei Monggol has proved coal resources of 217.4 billion tons, and its long-term reserves may exceed 1.2 trillion tons. In both these respects, it is second in the country. It has 15 coal fields with reserves of more than 5 billion tons; the Ordos coal field has coal reserves equivalent to 10 percent of the national total and is the largest of the world's seven major coal fields. Nei Monggol has abundant water resources: the Yellow River, the Ergun River, Daihai Lake and Huangqihai Lake are all within its boundaries. The Yellow River flows through the large Wuhai, Dongsheng, and Junggar coal fields. There are 17 locations that are suitable for the construction of power plants with capacities of 1 million kW or more, with a total potential capacity of 35.47 million kW. Nei Monggol's territory spans the "three northern" regions; it is near industrially developed regions that are relatively resource-poor, and electric power markets in such areas as Beijing, Tianjin, Hebei, Liaoning, Jilin, and Heilongjiang offer extensive prospects.

The question of whether to ship coal or transmit energy has been aggravated by the contradiction between rail transport and haulage capacity. But the problem is becoming better understood and views are maturing. In large-scale development of the electric power industry, the changeover to local resource conversion and from hauled coal to transmitted electricity will both decrease the pressure on the railroads and realize the objectives of a short construction cycle, low costs, and good benefits.

Party secretary of the autonomous region Wang Qun [3769 5028] has repeatedly emphasized that "If the development of the energy industry can be done rapidly, it should not be done slowly, and if it can be done at a run it should not be done at a walk. We must make electric power lead the way, replace coal with electricity, have the coal industry stimulate the power industry, export more electric power outside the

province, and convert resource advantages into economic advantages." As a result, the silent expanses of Mongolia have become the scene of bustling activity in the construction of an electric power base.

Between 1988 and 1992, the region expended a total of 3.389 billion yuan to fund electric power construction. It installed 1.5098 million kW of new generating capacity, representing an average increase of 30 percent a year. Its total installed generating capacity has reached 4.103 million kW, and it has built 793 km of 220-kV transmission lines. In the western zone, the framework of a superhigh-voltage grid running eastward from Wulashan to Datong has been built, and power lines have been connected to the North China power grid and have been put into operation. In five years, a total of 81.787 billion kWh of electricity has been produced, yielding a profits tax of more than 1.6 billion yuan.

Major electric power construction projects spread like wildfire, and "sun cities" sprang up across the land. In the course of five years, three 100,000-kW generating sets were added at Baotou, and the installed capacity at the Fengzhen power plant in the floodplain of the Yinma River reached 600,000 kW. The construction of the first stage of the Junggar power plant, with two 100,000-kW generating sets, has been completed. Work on the expansion of facilities at Hohhot, Yuanbaoshan, Tongliao, and Huiliuhe and on new construction projects at Haibowan, Yimin, Huolinhe, Youzhong, and Dalad has been whipped up to a superhigh pace. Magnificent blueprints for 17 large power plants with capacities of 100,000 kW or more have been issued.

In the first six months of this year, Nei Monggol's electric power industry has experienced four gratifying events: a total output of 567.5 billion kWh and the transmission of 954 million kWh of electricity to North China, representing increases of 13.8 and 17.04 percent respectively over last year; payment of 255 million yuan in profits taxes, up 14.14 percent from the previous year; 80-percent implementation of 2.5 billion yuan in investment funds; and the signing of 13 equipment delivery contracts, representing a total of 4.6 million kW of capacity.

Benefitting From Policies, and Using Others' Funds for Power Production

Under a planned economy, the electric power industry receives centralized state investments for construction, prices are specified centrally by the state, and output, distribution and sales are controlled by government departments. As a result, very large investments are inherently unmanageable, the prices charged for electricity do not reflect production costs, the enterprises take on increasing debt, and investment capabilities are, in essence, lost. Nei Monggol's economic strength was limited, and even in the best years, the local financial departments could only squeeze out 30 or 40 million yuan in funds for electric power.

In 1988, the leadership of the Nei Monggol Electric Power Management Office signed an eight-year funding and production agreement with the government of the autonomous region. This broke the stereotype of having exclusive government control of power production and began a new practice of independent operations, "having those who pay the money produce the power and receive the benefits," with unified creditor's rights. The contract specified that the profits paid annually to the finance organs would be entirely

returned in the form of investments in electric power construction; it instituted new prices for new power generating facilities and new heat supply facilities; and those who used external funding for power production were not only to receive favorable consideration in state policies, but in addition would be given special consideration in taxation, land use, and the like. When this policy was announced, investors appeared in droves. In the last several years, they have established reliable investment partnership ties with a multitude of domestic financial groups and enterprises, as well as more than 10 countries and regions.

The leadership of the Nei Monggol Electric Power Management Office further liberated its thinking by expanding funding channels. Cause for encouragement is the fact that this April, leaders from Beijing City and the Ministry of Electric Power personally visited Nei Monggol to discuss arrangements for the provision of electricity to the capital. For many years Beijing has been short of electric power, and power cutoffs and cutbacks are a frequent occurrence. This fact not only imposed serious constraints on Beijing's economic development and caused great inconvenience to the masses, but was also inconsistent with Beijing's status as the capital. On 23 April, the three parties signed a joint power generation agreement, whose first stage is about to begin. According to the agreement, by 1995 Beijing will have made contributions totaling 1.55 billion yuan, the installed generating capacity in Nei Monggol's western power grid will have increased from 1.835 million kW to 4 million kW, and the amount of electricity that it supplies to Beijing will have increased from 1.1 to 1.5 million kW, so that Beijing will no longer experience power shutoffs. The second stage will begin in 1996, and by the end of the Ninth 5-Year Plan, the installed capacity of Nei Monggol's western power grid will reach 12 million kW, enabling it to supply 5 million kW of electricity per year to the Beijing-Tianjin-Tangshan region.

Will Electric Power Become the West's "Radiant Center"?

China's electric power industry bears a heavy burden and has a long road to travel. This year, the Nei Monggol Autonomous Region party committee repeatedly emphasized the guiding ideas in accelerating power industry development. The Nei Monggol Electric Power Management Office drafted objectives and measures for the period through the end of the century in order to make electric power construction the "radiant center" that will bring prosperity to the western region.

- Make reform increasingly thorough, transform the mechanism, move toward markets, strengthen management, stabilize existing power generating facilities, implement capital construction investments of 1.83 billion yuan, commission 374,000 kW of generating capacity, and carry on effective preparatory work for new power plant construction.
- Make thorough use of advantages in resources, location, and policy, develop funding channels, attract large amounts of domestic and foreign construction investment.
- Jointly with large domestic power production groups, use such flexible and diverse forms as equipment investment partnerships to obtain domestically produced equipment. Concurrently, appoint experts to be responsible for obtaining equipment from the west and from Russia.

Implement mutual guarantees for coal supply, power production, and transport, unite with organizations that use electricity to produce steel and aluminum, and assure that materials are delivered on time.

The objectives are as follows: add 4.5 million kW of new generating capacity in the region by the end of the Eighth 5-Year Plan, with the total installed capacity reaching 8.25 million kW, and deliver 1.5 million kW of electricity to North China and 2.3 million kW to Northeast China; by the year 2000, bring the total installed generating capacity in the region to 21.369 million kW and deliver 5 million kW to North China and 6.5 million kW to Northeast China.

A Japanese economist exclaimed in amazement that China is implementing a "concentric circle" strategy in its energy economy. As he expressed it, the Ordos is the inner circle, which will be the first to produce an effect and also the pivot which will receive the benefits first. The second circle, which radiates outward for 200 km, will constitute Nei Monggol's central economic region. Finally, using the world's most advanced technology, electric power will be transmitted outward over a radius of 1000 km. These radiating circles will thus encompass the central region, representing a third of China's area. Thus the radiating segments of circles or "gradient circles" produced by the relatively developed coastal regions will advance circle by circle into the interior, and the resource-rich great north-western region will radiate its powerful electricity outwards in expanding circles. Ultimately, when the two sets of radiating circles coalesce into a network, the differences between northern and southern China and between eastern and western China will shrink rapidly.

Nuclear Power: Partial Solution to Energy Bottleneck

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[Article by reporters Chen Zujia [7115 4371 3946] and Zhu Jingrui [2612 4552 5387]]

[Text] On 15 December 1991, the Qinshan nuclear power plant sent a surge of power into the East China grid; and the commercial operations of the No. 1 unit of the Guangdong Daya nuclear power plant also began at the close of this year, and it will be delivering power to Guangdong and Hong Kong well into the future.

As China welcomes the arrival of nuclear power, this energy source is already supplying one-sixth of all of the electricity used in the world. In 1992, 424 nuclear power reactors were operating in various countries throughout the world.

1. Nuclear Power: The Key to Solving the Problems of Development

In the 1960s and 1970s, as China was shipping its northern coal resources to the south, nuclear power was growing sharply in Europe and America. In over 30 years, the U.S. built more than 100 nuclear power reactors and became the leading nuclear power country in the world. France made it a national policy to solve its energy shortage by developing nuclear power, and in only 17 years, since 1973, the ratio of nuclear power rose from 4 percent to 72 percent, and cheap reliable nuclear power has become the pillar of the French economy. Today, one-third of all of the electric power used in the energy-poor countries of the European Economic Community comes from nuclear power. In short, the fact is

that the developed countries of Europe and America know there can be no entry into the 21st century without nuclear power.

In the 1980s, the center of world economic growth moved to the Asian-Pacific area and the nations of the Pacific rim, and the nuclear accidents at Three Mile Island in the U.S. and at Chernobyl in the Soviet Union cast a cloud over the idea that nuclear power was the key to economic development.

Nuclear technology forces in Europe, America, and Japan are collaborating in applied research on a new reactor that is safer, cleaner, more economical, and consumes nuclear materials more completely—the fast breeder reactor. Advanced nations have increased their research on nuclear fusion which could provide mankind with an inexhaustible supply of energy.

There can be no doubt that nuclear energy will be an important source of energy in the 21st century. Countries that do not gain access to nuclear energy will not join the ranks of advanced countries in the future world.

2. Nuclear Power: The Antigen for Prevention of Economic Difficulties on the Southeast Coast

The energy shortage has become the "bottleneck" to China's economic development. The energy pinch is most strongly felt along the southeast coast, which is also feeling the effects of transportation pressures and environmental pollution, and the dislocated energy structure is the root cause of it all.

China's coal resources are mainly concentrated in Shanxi, Shaanxi, and western Inner Mongolia, 70 percent of the hydropower resources are in the southwest, and 80 percent of the electricity in the southeast is produced from coal. Northern coal is shipped south and western coal is shipped east. Coal for electric power accounts for 46 percent of the freight shipped on the Beijing-Shanghai and Beijing-Guangdong rail lines, 30 percent of the freight on the Huangjin waterway, and 26 percent of the freight on the highways. And that still does not satisfy the demand. In Jiangsu Province, there have been shutdowns of over 40 percent of the power generators because coal supplies were used up.

While coal provides the power for economic development, it also is the cause of transportation and environmental problems. One 1,000MW thermal power plant discharges tens of thousands of tons of harmful gases containing sulfur dioxide and nitrogen oxides into the atmosphere every year, and more than 100 kilograms of such carcinogens as mercury and cadmium.

How then to extricate the southeast coastal economic zones from the grip of energy, transportation and environmental problems? If, as with a single surgical stroke to cure three ailments, there were a single energy resource, which with a singular investment could heal all afflictions, wouldn't that be more ideal? Let those who would send hydropower over extreme distances behold the light of nuclear power.

It is easy to see the advantages of nuclear power over coal power. A 1,000 MW pressurized-water reactor needs only 30 tons of fuel a year, which is 1 one-hundred-thousandth that of a thermal power plant of the same scale. Pollution from a safely operated nuclear power plant is negligible, its radiation discharge being less than a coal power plant of the same scale.

In 1970, having heard reports on the situation in Shanghai, Premier Zhou Enlai said that the solution to Shanghai's energy shortage is nuclear power. Nuclear power has been the antidote for many energy deficient places in the world that have concentrated populations and rapid industrial growth, and there is little doubt it will be good medicine for the southeast coastal areas.

3. Nuclear Power: Not Easy for China

Although the advantages of nuclear power are obvious;

Although China has plenty of uranium to support nuclear power;

Although through the process of developing nuclear weapons, the uranium mining industry grew well, uranium isotopes were separated, nuclear fuel elements were produced as planned, reactors were built and spent fuel was processed, all of which rounds out a complete nuclear industry system;

Although China has a force of nuclear industry specialists tens of thousands strong with decades of hard experience and training;

Although China's basic industries are well developed and can meet the requirements for developing nuclear power;

Nuclear power is, nonetheless, in an infantile stage in China.

By the end of September, the Qinshan nuclear power plant had generated a total of 1.7 billion kWh of electric power. Adding the power generated by the two 900MW units of the Daya Bay plant, as of late 1993 and mid-1994, nuclear power provides only 1 percent of the total output of electricity in China.

China was late on the scene, and missed out on the biggest opportunity for development. On 28 February 1990, Qian Sanqiang, Li Jue, Jiang Shengjie, and Wang Ganchang submitted a statement to Jiang Zemin and Li Peng calling for the early establishment of mid- and long-term plans for China's nuclear power development, and expressed the sincere concern and interests that the four distinguished elder scientists and leaders have for their country and their people. On 30 April, Premier Li Peng responded to them by letter saying, "On 15 March the State Council Nuclear Power Leadership Group Plenary Session determined that nuclear power would be included in the National Economic Plan."

The coastal provinces of Fujian, Zhejiang, Jiangsu, Shandong, Liaoning, and Hainan, and the inland provinces of Sichuan, Jiangsu, and Hunan have all expressed their desire to build nuclear power stations, and the strategic goal for the country today is to speed up development, and get into the race. In August 1993, the China National Nuclear Industry Corporation assembled the talent and facilities in its nuclear engineering, design, prospecting, construction, facilities acquisition and technical services fields to form the China International Nuclear Engineering Group Enterprise, to gain some ground in opening up a nuclear power market.

There are, however, some obstacles to moving forward just yet because the role of nuclear power in China's economic development is not fully recognized by the policy makers,

there is no unified leadership among national nuclear power departments, and the lack of guaranteed funding sources is a hindrance to scientific research and construction.

Nuclear power construction requires early investment and its success depends heavily on safety and financial guarantees. The two other nuclear power plants now tabled for construction are the Guangdong and Bohai Bay plant in Liaoning are thoroughly planned from the safety standpoint, but whether firm funding will be assured is another matter.

The development of nuclear power is a complex system of engineering because of its particular requirements for end-to-end facilities research and production, supplying nuclear fuel, processing depleted fuels, processing the "three wastes," and the selection and release of power plant sites; and the engineering process demands a high degree of unified leadership and decisive action. Without it, the application of nuclear power to the economic bottleneck will not realize its maximum advantage, and only that will fulfill the dreams of the nuclear workforce, slake the country's thirst for electric power, and brighten the hearts of the people. China needs the light and heat of nuclear power to break the bottleneck.

1993 Power Output: 800 Billion Killowatt-Hours

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[Article by reporter Qin Jingwu [4440 0079 0582]]

[Text] The Chinese electric power industry completed its annual mission for the installation of new power capacity nine days ahead of schedule, and kept the annual capacity of newly installed large- and medium-sized units above 12,000 MW for the sixth straight year, maintaining the fastest pace of electric power development in the world.

The total national power output for the year was 815 billion kWh, 9.44 percent over last year, of which 671 billion kWh was from thermal power, an increase of 9.16 percent, and hydropower was 144 billion kWh, a 10.77 percent increase over last year. The entire electric power industry earned 19.9 billion yuan in profit taxes, an increase of 15.4 percent over the previous year.

Although China's power industry has grown rapidly, the national economy has grown even faster and the power supply is more than 20 percent short of needs. In order to put electric power ahead of the curve, the Ministry of Electric Power is planning to add 15,000 MW of new units annually from 1995 to 1997, and 20,000 MW annually from 1998 to 2000, which will be an increase of about 300,000 MW of installed capacity by the end of the century, and will basically meet China's domestic needs. The government will make a great effort to raise the money for this, and will encourage joint efforts among administrative areas to get electric power and develop hydropower resources, and will encourage coastal economic development zones to make even greater investments into energy bases to get power, and for sending power out of energy rich areas; Economically developed areas will be encouraged to raise funds for power, and power enterprises will be allowed to go directly to the banks and other financial institutions for loans, or to issue bonds and shares.

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